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Thomas Jefferson  
Soil Conservationist

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U. S. DEPARTMENT OF AGRICULTURE



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*A lover of the soil, Jefferson was one of a small group of early conservationists who toward the opening of the nineteenth century attempted to keep the soil productive and stable. Jefferson believed that a sound agriculture was the foundation of a great nation and that letting the topsoil wash off was wasting the substance of future generations. For at least a part of 34 of the years between the time he was 24 and 64, however, Jefferson was absent from his beloved farms performing some service either for Virginia or for his country. Thus he was not able to conserve the substance of his lands as he wished. On his return from Europe in 1794 he found "their degradation by ill-usage much beyond what I had expected." When at last he retired to Monticello much of his topsoil was gone and his farms were burdened by debts from which they never recovered.*

*Then as now, conservation of the land was vital to success in war. Jefferson recognized this and said: ". . . when forced into war, the interception of exchanges which must be made across a wide ocean, becomes a powerful weapon in the hands of an enemy domineering over that element, and to the other distresses of war adds the want of all those necessities for which we have permitted ourselves to be dependent on others . . ."*

*Unfortunately, too many of our forefathers did not follow the lead of Jefferson but got into the habit of looking on our agricultural lands—the most indispensable of all our natural resources—as of limitless extent and inexhaustible productiveness. Wasteful farming went ahead without let or hindrance until nearly 200 million acres of cropland in this country were ruined or seriously affected by erosion.*

*However, we still can profit from what Jefferson did—and that's part of the reason for this publication—if we make up our minds that hereafter we will use scientific methods of treating the land so that our productive soil will stay in our fields, where it can produce for the war and keep on producing in the years of peace to come.*

*Aside from the present-day conservation lesson to be learned from Jefferson's teachings, this publication is designed to record and acknowledge one more of the many worthy efforts of a great American citizen. Let it be noted and remembered that Thomas Jefferson was a pioneer American soil conservationist.*

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Washington, D. C.

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# Thomas Jefferson

## *Soil Conservationist*

By HUGH H. BENNETT, *Chief, Soil Conservation Service*

Thomas Jefferson, third President of the United States, author of the Declaration of Independence, author of the Statute for Religious Freedom, and founder of the University of Virginia, was in his own eyes first and always a farmer. "No occupation," he wrote in 1811 at the age of 68, "is so delightful to me as the culture of the earth." Moreover, he always considered farmers "the most valuable citizens." In fact he thought that the husbandman who could "double his food" by good farming methods deserved "to rank . . . next after his Creator."

Jefferson's interest in farming was attested early in life. Between 1767 and his marriage in 1772, he successfully managed the farms left him by his pioneer father. Peter Jefferson, sturdy member of the frontier community, had served as surveyor, magistrate, sheriff, and colonel of the militia. To his eldest son, Thomas, he bequeathed more than 2,000 acres in Albemarle County, Va. Thomas Jefferson, before his marriage, more than doubled the acreage and maintained the farms as a successful business enterprise, yielding the rather substantial income for those days of about \$2,000 a year (8).<sup>1</sup>

Colonial Virginia at this time depended largely on English markets for the sale of its agricultural products. In the 150 years since the New World was opened by colonization, tobacco had become the chief cash crop, and this, combined with corn, the staple food crop, had already taken heavy toll from much of the originally productive soil. Erosion and soil exhaustion followed rapidly in the wake of the pioneers, as sloping land was cleared of trees and planted continuously to the same soil-depleting crops.

Jefferson's own words describe the current system of land usage:

The highlands, where I live, have been cultivated about sixty years. The culture was tobacco and Indian corn as long as they would bring enough to pay the labor. Then they were turned out. After four or five years rest they would bring good corn again, and in double that time perhaps good tobacco. Then they would be exhausted by a second series of tobacco and corn. (Letter to President Washington, 1793.)

Under this endless crop sequence of tobacco and corn, planted in rows that usually ran uphill and downhill, much of the virgin topsoil was lost. By Jefferson's time the original surface layer of soil had been washed off many Virginia hillside fields by the rains and carried down into the rivers, leaving raw subsoil exposed.

<sup>1</sup> Italic numbers in parentheses refer to Selected References, p. 15.

## *Origins of Jefferson's Interest in Conservation*

As a student at the College of William and Mary, the tall freckled young man acquired the almost lifelong habit of making careful observations, conscientiously recorded, of Virginia's soils, climate, topography, and plant and animal species.

His copious notes, which he put together in 1781 under the title Notes on Virginia, constituted one of the earliest scientific studies of the natural resources and potentialities of one of the new States. They provided much useful material for a scientific approach to agriculture.

Jefferson reports here his detailed findings on Williamsburg's climate, and they are remarkably similar to the present-day Weather Bureau reports. According to his measurements, the annual precipitation was 47 inches. This is about an inch and a half more than the average precipitation reported by the Weather Bureau for 1900 to 1931. He also recorded "least and greatest daily heat" and the daily wind direction and made observations on the effect of frost on various plants. His weather observations were used in connection with his practical farming program.

The years during which the Notes were gathered and published were some of the most eventful in human history. They covered the birth of the new republic and the precarious period in which it struggled for stability and strength. Thomas Jefferson as lawyer and statesman during that time and the decade following took precedence over the man as farmer and soil conservationist.

## *No Wavering in Farm Interest*

Thus, until 1794, when he freed himself from "the hated occupations of politics," although only temporarily, as he was soon to discover, Jefferson's farm management necessarily was largely absentee. The actual operations were entrusted to the overseers who supervised the plantations. Jefferson's holdings now covered more than 10,000 acres since the property brought him by his wife about equalled his own (7) and included the farms of Monticello, Lego, Tufton, Pantops, Shadwell (see map opposite p. 8), and Poplar Forest. During the 5 years he was in Europe, however, Jefferson sent his overseers detailed instructions as to farm plans. He also forwarded seeds of European grasses, rice, olives, and other plants to be tested in different soils and climates in America. Moreover, he studied agricultural details of the European scene and, as time permitted, noted his findings and sent them home.

Jefferson's return to Monticello was marked by disappointment. In May 1794 he wrote President Washington:

... I find on a more minute examination of my lands than the short visits heretofore made to them permitted, that a ten years' abandonment of them to the ravages of overseers, has brought on them a degree of degradation far beyond what I had expected ... I am not yet satisfied that ... much will be done this year towards rescuing my plantations from their wretched condition. Time, patience and perseverance must be the remedy ...

## *He Turns to Conservation Farming*

Jefferson undertook to rebuild his depleted fields, and during the next few years he initiated an ambitious program of soil conservation.

This first phase of his conservation activities emphasized chiefly development of a system of crop rotations, including legumes, the use of fertilizers,

and the practice of deep plowing. "Horizontal ploughing," the principal cultural practice by which Jefferson's conservation efforts are remembered today, is not mentioned in his agricultural records of this period. His approval of contouring as a measure of erosion control came somewhat later.

From 1794 to 1797, Jefferson maintained active contact with all operations on his several farms and strove earnestly to repair the damage inflicted by careless overseers. Almost daily his spare figure—the lean straight form of the skilled horseman—could be seen riding across the broad acres as he checked details of field arrangement, crop yields, food needs for the plantation population of almost 180 slaves, and the production of Monticello's miniature factories, where nails, cloth, grist, and other essentials were produced for the upkeep of the self-sufficient community (11).

During these years Jefferson exchanged agricultural information with and sought advice from the leading farmers of the day, including James Madison, George Washington, and John Taylor.

He strongly advocated the use of red clover—a good soil-conservation plant. He recommended it as an important part of a crop rotation to offset the exhausting effects of such crops as wheat. It had, he believed, multiple benefits: it furnished an excellent cover crop, highly preferable to bare fallow or even "spontaneous herbages," and it supplied good pasture at the same time. Moreover, he found that it would grow in fields "considerably harassed with corn."

Jefferson was interested in other soil-improving plants as well, particularly vetch. He experimented with various types of vetch to determine their effectiveness for winter cover and in rotations. He said: "I think it important to separate my exhausting crops by alternations of ameliorators."

Perhaps most significant of all were Jefferson's recognition of the eroding effects of clean-tilled crops and his attempts to introduce substitute crops that would better protect his fields, which were mostly sloping and erodible. In June 1793, he wrote to President Washington: "Good husbandry with us consists in abandoning Indian corn and tobacco, tending small grain, some red clover following . . ."

Later, in December 1794, in a letter to John Taylor, he wrote: "The first step towards the recovery of our lands is to find substitutes for corn and bacon. I count on potatoes, clover, and sheep. The two former to feed every animal on the farm . . . and the latter to feed [the Negroes], diversified with rations of salted fish and molasses . . ." This quotation notes the principal points in Jefferson's farm conservation program; his recognition of the dangers of row crops; his belief in soil-building and soil-holding legumes in the rotation; a plan for diversified farming; and his interest in animal husbandry, principally sheep, partly for the sake of manure for fertilizer.

Jefferson understood that nature herself may gradually restore the fertility of the soil "in a long course of years," but because this natural process is so slow, he recommended manuring in addition to the use of rotations that included clover as a means of accomplishing "more in one than the atmosphere would require several years to do." He also publicized the experiments being carried on with plaster, or gypsum.

In Jefferson's time, comparatively few colonial farmers were concerned with returning to the earth any of the vital elements withdrawn by cropping, or with crop rotations, fertilizers, and cultural methods. But Jefferson was concerned not only with current returns from the land but also with the effects of abusive farming on posterity. He acknowledged the prevailing circumstances in a letter to President Washington in 1793: ". . . we can

buy an acre of new land cheaper than we can manure an old acre." Nevertheless, he himself constantly looked for and tested ways of maintaining the soil's productiveness.

One of the most interesting items in his Farm Book—in which for nearly 50 years he jotted down bits of farm data such as plans, yields, and techniques—outlines an experiment on dung. He was not content merely to assume that animal manure would revitalize the soil and produce better crops; he planned tests to determine exactly how many cattle and how much time would be required to fertilize in this manner a given area of land and to measure its effectiveness by comparing the yield of wheat on the manured area with that from an equal area unmanured.

In his tests of legumes and grasses, Jefferson tried out numerous species, including the better known red clover, peas, and vetches, striving always to arrive at the best adjustment between environment and plant. He sought good grasses to bind the soil against washing by rain, to control gullies, and to improve hard-used land.

Jefferson's original 7-year rotation, outlined in his letter to Taylor, was as follows:

1. Wheat, followed the same year by turnips, to be fed on by the sheep.
2. Corn and potatoes mixed, and in autumn the vetch to be used as fodder in the spring if wanted, or to be turned in as a dressing.
3. Peas or potatoes, or both according to the quality of the fields.
4. Rye and clover sown on it in the spring. Wheat may be substituted here for rye . . .
5. Clover.
6. Clover, and in autumn turn it in and sow the vetch.
7. Turn in the vetch in the spring, then sow buckwheat and turn that in, having hurdled off the poorest spots for cowpenning [so these bad spots could be improved by the manure.]

Jefferson's main objectives in this rotation seem evident. He must have been aiming at a sharp reduction of clean-tilled crops—corn only once in 7 years. Wheat, apparently, was to be depended on as "the only one which is to go to market to produce money"; clover and vetches were to be soil "ameliorators" and provide pasture. However, because of the drain on farm output by a large plantation population and constant numerous guests, Jefferson apparently was not able to put his plan fully into practice. A simplified and shorter rotation seems to have been the actual system of crop succession generally followed.

### *Jefferson's Moldboard of Least Resistance*

The plows of Jefferson's time were crude wooden implements. The design had never been standardized; each plow was the product of either a local artisan or the farmer himself. The average eighteenth-century plow penetrated the soil to only a slight depth, and for many years Jefferson sought some means whereby "deep ploughing" could be done. He had observed the bad effects of shallow plowing, which often merely loosened the topsoil so that it would wash away more easily.

Out of Jefferson's researches on this problem came his moldboard of "least resistance." This moldboard for the plow, developed according to the principles of physics, made it possible to plow to a depth of about 6 inches. It was one of the first attempts to standardize agricultural machinery and was so designed that the moldboard could be duplicated by any farmer.

Jefferson's moldboard for the plow has contributed, strangely enough, to both soil saving and soil wastage. On the positive side are its usefulness for contour ridging of erodible fields, for plowing out shallow open ditches, for

broad ridging imperfectly drained flat lands, and for other uses. On the other side, this moldboard made it easier to tear up land indiscriminately. It contributed to "clean plowing," and we adopted this method far and wide, overlooking the fact that on some lands it is much better to maintain a vegetal covering.

### **Horizontal Plowing**

Jefferson's agricultural and soil-conserving interests followed him into the White House. White House dinner-table conversation is said to have been as likely to touch on some problem of cultivation at Monticello as on the fate of democracy in Napoleonic France. During these years, Jefferson's property was managed by his son-in-law, Thomas Mann Randolph, a "man of science, sense, virtue, and competence." Randolph had introduced into this hilly Virginia country a new method of cultivation that was destined more than a hundred years later to make over the face of America. This method was "horizontal ploughing," which we know today as contouring.

Jefferson for many years watched Randolph's efforts to prove the effectiveness of horizontal plowing in preventing erosion of sloping land. After he retired to Monticello permanently, he became an enthusiastic supporter of this method. In recounting to William Burwell (1810) a violent storm in which 3 inches of rain fell in a single hour, he wrote:

Every hollow of every hill presented a torrent which swept everything before it. I have never seen the fields so much injured. Mr. Randolph's farm is the only one which has not suffered; his horizontal furrows arrested the water at every step till it was absorbed, or at least had deposited the soil it had taken up.

This conviction as to the value of contouring remained with Jefferson throughout the rest of his life, spent in agricultural pursuits at Monticello. In 1813 he wrote to Charles Peale:

Our country is hilly and we have been in the habit of ploughing in straight rows whether up and down hill, in oblique lines, or however they lead; and our soil was all rapidly running into the rivers. We now plough horizontally, following the curvatures of the hills and hollows, on the dead level, however crooked the lines\*may be. Every furrow thus acts as a reservoir to receive and retain the waters, all of which go to the benefit of the growing plant, instead of running off into the streams. In a farm horizontally and deeply ploughed, scarcely an ounce of soil is now carried off from it.

Contour cultivation also is definitely labor-saving, as Jefferson pointed out: "The horses draw much easier on the dead level, and it is in fact a conversion of hilly grounds into a plain." Moreover, Jefferson found it easy to mark out the contours: "To direct the plough horizontally we take a rafter level . . . A boy of thirteen or fourteen is able to work it round the hill, a still smaller one with a little hough marking the points traced by the feet of the level. The plough follows running through these marks."

The best description of this practice is given in a letter to Tristam Dalton, written in May 1817:

Our practice is . . . to lay off guide lines conducted horizontally around the hill or valley from one end to the other of the field, and about 30 yards apart. The steps of the level on the ground are marked by a stroke of a hoe, and immediately followed by a plough . . . We generally level a field the year it is put into Indian corn laying it into beds 6 ft. wide, with a large water furrow between the beds, until all the fields have been once leveled. The intermediate furrows are run by the eye of the ploughman governed by these guide lines . . .

Jefferson also had constructed an excellent bench terrace for the vegetable garden almost at the top of Monticello's steep slopes. The nearby orchard and vineyard sites have the appearance of land that has long been contoured.

## *Jefferson's Later Conservation System*

After 1809, when he retired from the Presidency, Jefferson was able to throw himself completely into agricultural and domestic affairs. His farming system is described in a letter to Jean Baptiste Say in 1815:

Our culture is of wheat for market, and of maize, oats, peas, and clover, for the support of the farm. We reckon it a good distribution to divide a farm into three fields, putting one into wheat, half a one into maize, the other half into oats or peas, and the third into clover, and to tend the fields successively in this rotation. Some woodland in addition, is always necessary . . .

As compared with his proposed 7-year rotation of 1794, this system was simpler and shorter. For the rolling clay loam land of Monticello and vicinity, this plan of Jefferson's represents fairly good land use, especially under contour cultivation. That this plan was actually followed for several years seems substantiated by Jefferson's records. In his Farm Book, an entry for Monticello for 1809 reads as follows:

. . . 3 fields of 60 acres each.  
1 for half corn, half oats, peas or millet  
1 for wheat 60 acres  
1 for clover 60 acres

and aim at a fourth for clover also as soon as we can.

The entry for 1811 on the crop system used on his Lego farm is almost identical.

Jefferson sought constantly for new crops adapted to his conditions of land and climate, and he instructed his overseer, Edmund Bacon, to conserve timber by "never cutting down a tree for firewood or any other purpose as long as one can be found ready cut down . . ."

## *Promotion of Conservation Farming*

Jefferson's promotion of improved methods of farming went beyond the confines of his own land. Through his amazingly voluminous correspondence, he publicized virtually every new and useful development in soil use and cultural practices. Jefferson's sponsorship of progressive conservation farming helped achieve an agricultural renaissance in the early part of the nineteenth century.

The flow of letters dealing with agricultural needs and practices, including conservation, in this age of restricted communication and transportation, functioned somewhat like a journal and did much to stimulate and spread agricultural advancement both at home and abroad.

Jefferson encouraged agricultural societies as a means of developing and spreading good farming techniques. Characteristic was his participation in the Albemarle Agricultural Society, founded in 1817. Composed of 30 leading landowners, with holdings in 5 counties, the society adopted a platform almost identical with that offered by Jefferson in 1811 in his "Scheme for a System of Agricultural Societies." The following three items from his "Scheme" reflect his preoccupation with soil conservation:

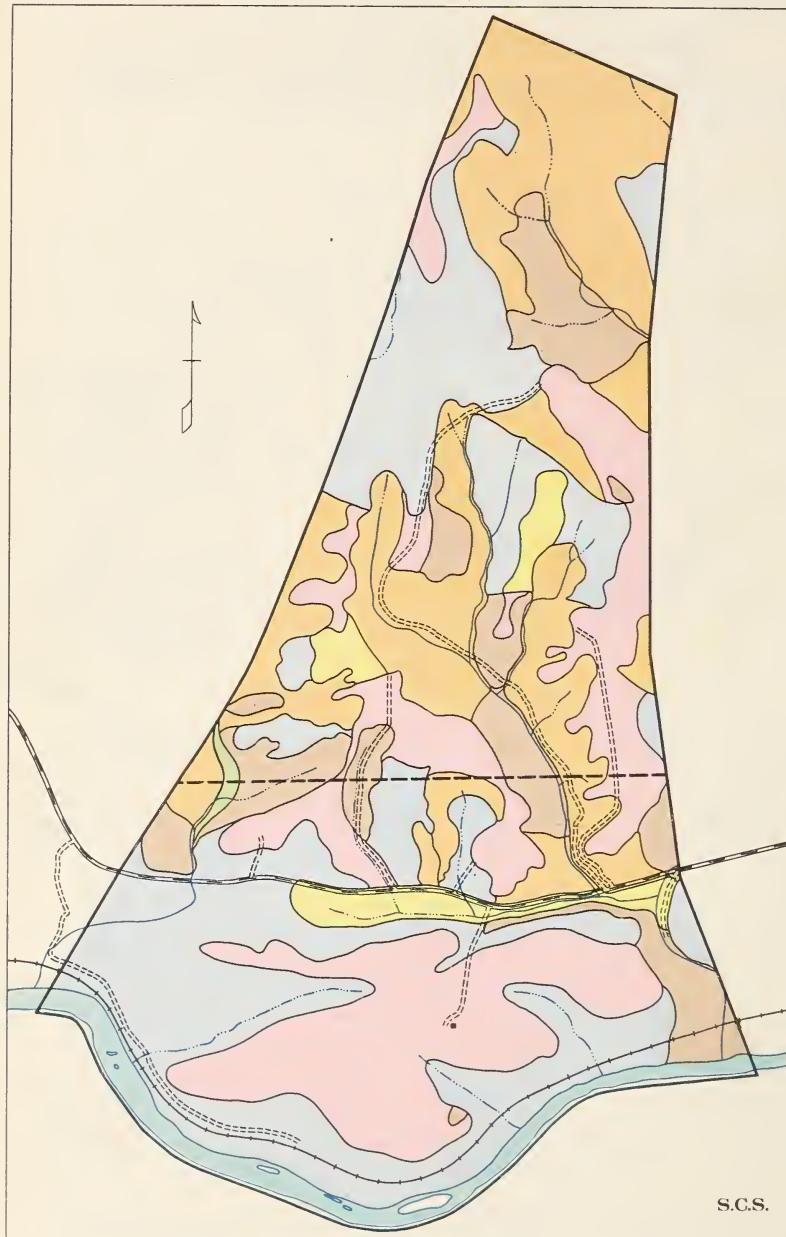
4th. Rotations of crops, and the circumstances which should govern or vary them, according to the varieties of soil, climate, and markets, of our different counties.

7th. Manures, plaster, green-dressings, fallows, and other means of ameliorating the soil.

9th. A succinct report of the different practices of husbandry in the county, including the bad as well as the good, that those who follow the former may read and see their own condemnation in the same page which offers better examples for their adoption . . . it

VARIOUS TRACTS OF LAND OWNED OR OPERATED BY  
THOMAS JEFFERSON, WITH APPROXIMATE BOUNDARIES

FARM BOUNDARIES ARE INDICATED ACCORDING  
TO LOCAL INFORMATION, INCLUDING COUNTY RECORDS

LAND CAPABILITIES OF THE SHADWELL TRACT,  
ALBEMARLE COUNTY, VIRGINIA

## LAND-CAPABILITY CLASSES

SUITABLE FOR CULTIVATION WITH:

I - No special practices

II - Simple practices

III - Intensive practices

SUITABLE FOR OCCASIONAL  
CULTIVATION WITH:

IV - Limited use and intensive practices

NOT SUITABLE FOR CULTIVATION:  
SUITABLE FOR GRAZING OR WOODLAND WITH:

VI - Moderate restrictions

VII - Severe restrictions

would present every good practice which has occurred to the mind of any cultivator of the State for imitation, and every bad one for avoidance.

Each member of the society was to report on his own agricultural practices and to provide information on these points: Rotation of crops, average crop yield, acreage cultivated, amount of land cleared annually, the proportion of worn-out land, quantity of manure carried out, and quantity of plaster used and with what effect (12).

Recognizing that soil erosion could be conquered only through scientific treatment of the soil, Jefferson vigorously supported agricultural education and investigations at the university level. Agriculture "is a science of the very first order," he wrote to David Williams in 1803, urging the inclusion of agricultural techniques and experiments in college curricula; "It counts among its handmaids the most respectable sciences, such as Chemistry, Natural Philosophy, Mechanics, Mathematics generally, Natural History, Botany. In every College and University, a professorship of agriculture, and the class of its students, might be honored as the first."

### ***Relation of Jefferson's System to Modern Conservation***

According to modern criteria, Jefferson's agriculture to a very considerable extent would be found wanting primarily in terms of degree rather than kind. In his writings he mentioned many of the practices—though some he called by a different name—that a modern soil conservationist considers in making a farm conservation plan: Use of cover crops, of fertilizers, and of crop rotations that include grasses and legumes; interplanting a closer growing crop with a row crop; contouring; deep plowing where needed; gall and gully control; increased livestock production; and controlled woodland cutting.

He was aware of the importance of adjusting land use to land capability. Much of the steeper slopes immediately surrounding the mansion at Monticello he left in timber, and his Monticello vegetable garden and orchard he planted on bench terraces. Galled spots he "hurdled" off. Nevertheless, he did not possess the information necessary for modern conservation practices. Judged by current standards, much of the cultivated part of Monticello is so steep it should never have been put to the plow at all. Jefferson confined his field crops to slopes of lesser grade, but he evidently did not realize that even some of these slopes were unsuited to cultivation.

Like many other Virginians of his time, however, Jefferson did not give sufficient emphasis to pasture as part of the farm system. Again, however, this was primarily a matter of degree. While he encouraged the development of livestock husbandry, he apparently did not develop as much permanent pasture as is now considered essential to the well-being of Virginia's Piedmont farms. Conservation farming in areas like that around Charlottesville means, in contemporary Virginia, a balance of about 3 acres of pasture to 1 acre of cropland when the pasture is for beef cattle, or 3 acres of pasture to 2 acres of cropland when the pasture is for dairy cattle. Too large a proportion of cropland is likely to induce too much erosion on the soil in this rolling country, where much land is far better suited to grass and animal husbandry than to cultivated crops.

He understood the fundamental relationship between land tenure and soil treatment. In 1785 he wrote Madison: "The small landholders are the most precious part of a state." He was opposed to short-term leases because of the likelihood of their leading to neglectful farm practices. Jefferson clearly

understood that a short-term interest in the land was likely to result in abuse of the soil. Writing to Lafayette from Nice, France, he made these cogent comments:

In England, long leases . . . render the farms there almost hereditary, make it worth the farmer's while to manure the lands highly . . . Here the leases are . . . for three, six, or nine years, which does not give the farmer time to repay himself for the expensive operation of well manuring, and, therefore, he manures ill, or not at all.

Jefferson's later experience supported this view. His land at the hands of overseers and tenants deteriorated despite all his own attempts at sound land use.

### *Jefferson's Land Today*

Much of Jefferson's land passed out of the hands of his family immediately after his death. And with the dissipation of the holdings, his advanced conservation program seems to have been pretty generally abandoned.

Even Monticello itself, once the proud and beautiful center of the major intellectual currents of Jefferson's America, was affected by erosion. Some of the clearings were marred by deep gullies, or stripped by sheet washing. The estate was bought by the Thomas Jefferson Memorial Foundation in 1923 and erosion has been largely controlled. Today, after careful restoration, the terraced gardens flourish once more and most of the bare ugly spots have been healed by grassy plantings or by natural revegetation.

The part of Shadwell where Jefferson was born seems to have been relatively well tended for some three generations, or since it was bought by Downing L. Smith. Even so, the present operator, Dr. J. W. R. Smith, despite the use of fertilizer and the practice of rotations, has seen, "soil going down the river all my life." In 1940, when the Thomas Jefferson Soil Conservation District was organized in Albemarle County, Dr. Smith decided the district's soil-saving program was worth trying. Today, this good farmer, who in his own words became a better farmer through cooperation with the soil conservation district, finds that conservation is not only checking soil waste but is increasing his yields.

A complete farm-conservation plan has been worked out, based on the capability of the land as determined from the conservation survey. The land-capability of the part of Dr. Smith's farm formerly owned by Jefferson is shown on the lower part of the map opposite page 9. On the class III land used for crops the rotation has been improved to include several years of soil-building alfalfa and timothy, as well as corn and small grain. Strip cropping is now applied to all the cropland as a supporting practice for contour cultivation, and the steepest land has been withdrawn from cultivation. The pasture acreage has been increased and improved by more liberal use of fertilizer.

A major feature of conservation farming on this tract has been a shift in emphasis from cropping to livestock husbandry. This has resulted not only in increased yields on the cultivated area but also an enlargement of the carrying capacity of the pasture land.

This conservation-treated part of Shadwell is producing more livestock per acre than it formerly did. Conservation farming has lengthened the period of open grazing and shortened the time required for fattening cattle for market. In other words, the expense of maintenance has been reduced, and the stock can now be marketed in better condition. Today the Smith farm, of about 365 acres, supports nearly 70 head of cattle, whereas this tract,



*Strip cropping on the contour is now holding the soil on the cultivated fields of Shadwell farm, where Jefferson was born.*



*Erosion has made idle land of this field on the upper Shadwell tract. All the topsoil has been washed away. In places the gullies have cut into the "rotten rock" beneath the red subsoil.*

together with a tract nearly twice as large (now sold), formerly carried about 85 to 90 head.

Although the constant demands of public life prevented Jefferson from carrying out on his own farms the conservation practices he so strongly advocated, it is fitting that the evolution and the application of his principal recommendations have not only justified his convictions on conservation farming but have also redeemed a part of the land he loved so well. This excellent crop-and-livestock farm on the lower Shadwell tract is contributing to the war-food larder. Just across the highway to the north, on the upper Shadwell tract, much of the land has been abandoned because of the deep sheet washing and the numerous gullies knifing the hillsides—and is contributing little or nothing.

In fact, a conservation survey of Jefferson's farm lands today shows that most of the cleared part has suffered considerably from erosion, as has much of the older farm land in this foothills country. Some areas have undergone disastrous erosion and are no longer useful for practical cultivation even though the predominant soil of Jefferson's plantation—Davidson clay loam, a blood-red soil derived from "greenstone"—is of the kind that can be cropped almost as long as any part of the topsoil or upper subsoil is left. The topsoil is gone from the greater part of the older, sloping lands, and much of the subsoil also. On Tufton, for example, the topsoil has washed off more than half the cleared area, and there is no important area of the original Davidson clay loam left. Sheet washing has changed it to clay—by exposing the subsoil. Practically all of this area is now covered with broomsedge and other volunteer grasses, with considerable cedar in the older abandoned areas in the northwestern part. Much of this latter area has been severely gullied.

Although Shadwell seems to have been somewhat better cared for than some of the other plantations, it too has undergone rather severe sheet washing and some gulling on the steepest of the formerly cultivated slopes. About 60 acres are badly gullied. The conservation survey shows that, except for 18 acres, the original Davidson clay loam has all been changed to Davidson clay. This means, of course, that the topsoil has washed off. On the 60 acres of gullied land both the topsoil and the upper subsoil have been removed.

On the upper Shadwell tract, lying immediately north of the farm where Jefferson was born, washing has been so severe that much of the land has been abandoned. In places gullies have been cut down to bedrock, as on the steep slope about one-half mile west of the present dwelling. According to local information, some of this gullied tract was abandoned in 1885. It has not made much recovery with revegetation. Erosion is still active, although it probably will soon be checked with the plantings of pine and bicolor lespedeza made by the Soil Conservation Service.

At least 30 to 40 inches of soil and subsoil have been washed off much of this abused land since it was cleared of its original stand of hardwoods. This is shown by measurements of soil and subsoil depths on comparable slopes of the adjoining forested tract on the east, where the soil is similar to the virgin soil that formerly covered the present gullied area. The present growth in these old woods, where the land has never been cleared, is oak, hickory, and dogwood, intermixed with a sprinkling of shortleaf yellow pine and maple.

Most of the surface material of the abandoned gullied land consists of soft "rotten" rock and light red clay, which is the third layer of the normal



*Old bench terraces in an abandoned apple orchard.*

Davidson clay loam of the locality. This material is so soft that it erodes at a disastrous rate where unprotected. The remaining depth of soil to hard rock over much of the gullied area ranges from a few inches to not more than about 20 inches. In other words, this is ruined land insofar as further use for practical cultivation is concerned. Its only value is for grass, legumes, trees, and wildlife. A soil sample taken about half a mile west of the present residence, on an 18-percent slope, severely eroded, shows an organic-matter content of only 0.73 percent in the surface 6 inches, and this apparently consists of the remains of the roots of the occasional cat brier (smilax), dewberry, and scrub blackberry growing here.

In the nearby hardwoods, a sample of Davidson clay loam taken on a 12-percent slope, shows an organic-matter content of 5 percent in the surface 6 inches of brownish-red mellow clay loam, and of 1.41 percent in the blood-red moderately friable clay of the upper subsoil, with extends to the third layer, the soft "rotten" rock and lighter red clay 30 inches below the surface.

Since Jefferson's time, contouring has pretty well passed out of general use in this part of Virginia. It is not possible to say just why it was finally given up by so many farmers for the wasteful practice of straight-line plowing in a country of numerous steep slopes and predominantly rounded topography.

At various points on Jefferson's neighboring lands there is evidence of contouring in places that were abandoned long ago. There is fairly good bench terracing, for example, in an abandoned apple orchard just east of Auburn Hill Plantation. Near this abandoned orchard a part of Auburn Hill had just been plowed on March 15, 1944, and the plowing followed the contour fairly well. This field formerly was in apples, and before that it was used as a vineyard, according to people living in the neighborhood. Also in this area there is evidence of contouring in some areas of second-growth pine.

On the north side of the tract lying north of Shadwell, a large apple orchard,

apparently about 30 years old, was planted approximately on the contour. Where the trees were planted precisely on the contour, fairly good bench terraces have developed and there has been good growth, good production, and little erosion. In the same orchard, however, where the planting was continued in the same general direction regardless of surface inequalities, some of the trees got so far off the contour as to amount to almost straight up-and-down planting. Where this happened erosion has been severe, stunting the growth of trees, reducing production, and even washing out some of the trees bodily.

There is an element of sadness in the speed with which humans sometimes forget or neglect the good examples and advice of great men, especially about those things they imagine to be a little more difficult to do the right way than to do the wrong way. Apparently, too many people concluded Jefferson's methods were a bit complicated and difficult, and so they gradually—and very unfortunately—laid them aside. No one took the trouble to prove that farming with conservation methods is easier and cheaper and more rewarding than farming the wasteful way. Jefferson stressed these exceedingly important matters, but until very recently nobody went out and made the measurements.

For example, the matter of proper gradient for hillside ditches was being discussed in South Carolina during the 1830's, but the question was not submitted to the scrutiny of research until nearly 100 years later. The South Carolina idea in the 1830's was that proper gradient for a hillside ditch—the early form of our present field terrace—should be somewhere between 9 and 30-odd inches in a linear distance of 100 feet, according to the land and the crop grown. A hundred years later our conservation experiment stations proved that a terrace should never fall more than 6 inches in a linear distance of 100 feet on land used for intertilled crops, and usually not more than 3 or 4 inches.

Despite all the good examples of conservation work practiced by Jefferson, his teachings were generally forgotten for several generations, and in consequence much good land was ruined or brought near the point of final depletion through uncontrolled erosion. The problem became too widespread to be solved by the efforts of individuals alone. During recent years, for the first time in American history, Government agencies have been helping to wage the fight against soil wastage that a few men like Jefferson were waging when our Government was new. Today we have a Nation-wide, coordinated program directed not only toward conserving soil but also toward increasing yields. The citizens of this country are understanding as never before that, as Jefferson wrote in 1813: "The spontaneous energies of the earth are a gift of nature, but they require the labor of man to direct their operation. And the question is so to husband this labor as to turn the greatest quantity of this useful action of the earth to his benefit."

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*From Thomas Jefferson's letters:*

No occupation is so delightful to me as the culture of the earth, and no culture comparable to that of the garden.

In a farm horizontally and deeply ploughed, scarcely an ounce of soil is now carried off from it. In point of beauty nothing can exceed that of the waving lines and rows winding along the face of the hills and valleys. The horses draw much easier on the dead level, and it is in fact a conversion of hilly grounds into a plain.

I hope my fields will recover their pristine fertility, which had in some of them been completely exhausted by perpetual crops of Indian corn and wheat alternately.

Horizontal furrows arrested the water at every step till it was absorbed, or at least had deposited the soil it had taken up.

If the plough be in truth the most useful of the instruments known to man, its perfection cannot be an idle speculation. And in any case whatever, the combination of a *theory* which may satisfy the learned, with a *practice* intelligible to the most unlettered labourer, will be acceptable to the two most useful classes of society.

The small landholders are the most precious part of a state.

The spontaneous energies of the earth are a gift of nature, but they require the labor of man to direct their operation. And the question is so to husband his labor as to turn the greatest quantity of this useful action of the earth to his benefit.

He who can double his food . . . deserves to rank, among his benefactors, next after his Creator.

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